

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

**Manufacturing and Assembly Processes**

registered by Organising Field 06 – Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit standards can be accessed via the SAQA web-site at [www.saga.org.za](http://www.saga.org.za). Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and **no later than 13 August 2007**. All correspondence should be marked **Standards Setting – Manufacturing and Assembly Processes** and addressed to

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## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**QUALIFICATION:*****Further Education and Training Certificate: Electro-Mechanical Winding***

SAQA QUAL ID	QUALIFICATION TITLE		
58861	Further Education and Training Certificate: Electro-Mechanical Winding		
ORIGINATOR		PROVIDER	
SGB Manufacturing and Assembly Processes			
QUALIFICATION TYPE	FIELD	SUBFIELD	
Further Ed and Training Cert	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	150	Level 4	Regular-Unit Stds Based

**PURPOSE OF THE QUALIFICATION****Purpose:**

The purpose of the qualification is to provide learners with the standards and range of learning required to test and rectify electro-mechanical components and to use and care for the relevant equipment in a responsible manner.

This is the third qualification in a series for learners who would like to follow a career in electro-mechanical winding and focuses on specialising skills on testing and rectifying faults with components. This qualification builds on the learning undertaken in the National Certificate in electro-mechanical winding at NQF Level 3, and it is assumed that learners entering into a learning programme towards this qualification are already competent in the core skills outlined in the Level 3 qualification.

This qualification requires an understanding of advanced operational procedures and sequences and includes the ability to read and interpret workshop manuals, workshop procedures, task instructions and job cards, as well as schedule the work of a team. What learners achieve in this qualification will serve as a basis for further learning where they may engage in more complex testing of electro-mechanical components and/or supervision of team members at NQF Level 5.

On completion of this qualification, the learner will be given recognition for the following exit level outcomes:

- Work as part of a production team.
- Test electro-mechanical components.
- Rectify faults on electro-mechanical components.
- Prepare electro-mechanical components for use.

Learners will generally carry out their role within the context of:

- A fully equipped engineering workshop.
- Set maintenance and works procedures.
- Given inspection and testing procedures.
- Given Quality Assurance policies, procedures and processes.

**Rationale:**

This qualification in electro-mechanical winding NQF Level 4 is the third qualification in a series for learners who want to follow a career in the field of manufacturing and assembly processing. This qualification focuses on developing skills and knowledge necessary to advance such a career and provides specific learning towards testing and rectifying faults with electro-mechanical components.

There is a need for this qualification in the industry because many people who are able to wind electro-mechanical components would like to advance their skills into testing the components and preparing them for use. They will also benefit from applying fundamental skills to their job in working together as a member of a team. They will learn to wind and perform mechanical tasks to the set procedures.

People who have achieved the skills and knowledge outlined in this qualification are normally employed in the following positions:

- Electro-mechanical component tester.
- Quality supervisor.
- Electromechanical fault finder.

There is currently no qualification in electro-mechanical winding at NQF Level 5, but learners may advance from these positions by achieving generic supervisory skills and be employed in a supervisory role.

There are currently approximately 1000 people employed in the industry that are required to perform component testing and repair as would be learnt through this qualification. This implies that many learners will be able to be given Recognition of Prior Learning (RPL) for one or more unit standards making up this qualification, and that the qualification is required by industry.

#### **RECOGNIZE PREVIOUS LEARNING?**

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#### **LEARNING ASSUMED IN PLACE**

This qualification assumes learners have attained the outcomes described in the National Certificate in electro-mechanical winding at NQF Level 3.

#### **Recognition of Prior Learning:**

This qualification may be obtained through a process of RPL. The learner should be thoroughly briefed prior to the assessment and support provided to assist in the process of developing a portfolio. While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit-level outcomes.

Care should be taken to ensure that the process used provides the learner with the opportunity to demonstrate competence and is not too demanding as to prevent the learner from implementing the RPL option towards gaining the qualification.

#### **Access to Qualification:**

This qualification recognises the skills, knowledge and values relevant in the workplace and will cater for learners who:

- Have attended courses and need to apply the knowledge gained to activities in the workplace.
- Are already workers and have acquired skills and knowledge without having attended formal training.

- Are part of a learnership program which integrates structured learning and operational experience.

Candidates applying for this qualification need to demonstrate physical competence in operating equipment and should therefore be physically able to contend with the circumstances required in the workshop environment. Access for learners with physical disabilities is dependant on the following:

- Type and severity of disability.
- The nature of the process and requirements of equipment operation.

### **QUALIFICATION RULES**

This qualification consists of a minimum of 150 credits made up as follows:

- Learners are required to achieve all 40 credits for communication from the available fundamental unit standards.
- Learners are required to achieve all 16 credits for mathematical literacy within the context of electro-mechanical winding operations.
- Learners must achieve all 68 credits from the core unit standards.
- Learners may select additional unit standards from any of the elective unit standards to achieve a minimum of 26 credits.

Note: The elective credits should be chosen in accordance with the requirements of the selected context and the interests of the learner.

### **EXIT LEVEL OUTCOMES**

1. Work as part of a production team.
2. Test electro-mechanical components.
3. Rectify faults on electro-mechanical components.
4. Prepare electro-mechanical components for use.

Critical Cross-Field Outcomes:

This qualification addresses the following generic outcomes in an integrated manner through the application of various unit standards:

- Work effectively with others as a member of a team/group.
- Organise and manage oneself and one's activities.
- Communicate using visual, mathematical and/or language skills in modes of oral and/or written presentation.
- Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been made.
- Collect, analyse, organise and critically evaluate information.
- Use science and technology effectively and critically, showing responsibility towards the environment and health of others.
- Understand the world as a set of related systems.

### **ASSOCIATED ASSESSMENT CRITERIA**

Associate Assessment Criteria for Exit Level Outcome 1:

- 1.1 Communication is maintained and adapted as required to promote effective interaction in a work context.
- 1.2 Work outputs facilitate effective achievement of group goals.

- 1.3 Personal relations are developed to maximise team output.
- 1.4 Responsibilities of different team members and the impact of poor workmanship in any area are explained in terms of the team output.
- 1.5 Work activity reports are completed in company required format within acceptable timeframes.

Associate Assessment Criteria for Exit Level Outcome 2:

- 2.1 Test equipment is set up and operated in accordance with manufacturer specifications.
  - Range: Test equipment includes megger, multimeter, ammeter, ductor, rissati, thermal imagers, vibration tester.
- 2.2 Components to be tested are identified from work instructions.
- 2.3 Consequences of testing incorrect components are explained in terms of work schedules and customer satisfaction.
- 2.4 Test results are interpreted to give an indication of the status of the component.
- 2.5 Test reports are completed in accordance with organisation requirements.

Associate Assessment Criteria for Exit Level Outcome 3:

- 3.1 Faults are identified that will prevent the component operating as required.
- 3.2 Potential methods of repairing the fault are identified and explained in terms of the procedure and expected result of repair.
- 3.3 The most suitable repair method is selected and applied to ensure compliance of the component with manufacturer specifications.
- 3.4 The repair is conducted in accordance with accepted timeframes and with minimum wastage.

Associate Assessment Criteria for Exit Level Outcome 4:

- 4.1 Sub components are checked for condition and assembled according to manufacturer specifications.
- 4.2 A logical assembly sequence is adhered to throughout the process.
- 4.3 Tools and equipment are used in accordance with their designed purpose.
- 4.4 The component is prepared for use in an acceptable time frame.
- 4.5 Applicable documentation is completed and submitted to relevant personnel in accordance with organisational requirements.

Integrated Assessment:

Because assessment practices must be open, transparent, fair, valid, reliable and ensure that no learner is disadvantaged in any way whatsoever, an integrated assessment approach is incorporated into the qualification. Assessment must take place according to the detailed specifications indicated in the unit standards associated with each exit level outcome.

Over and above the achievement of the specified unit standards, evidence of integration will be required within the context of an active learning environment. Assessors should note that the evidence of integration could well be presented by candidates when being assessed against the unit standards-thus there should not necessarily be separate assessments for each unit standard and then further assessment for integration. Well designed assessments should make it possible to gain evidence against each unit standard while at the same time gain evidence of integration.

**INTERNATIONAL COMPARABILITY**

As a starting point, this series of qualifications in electro-mechanical winding was compared to other, similar outcomes-based qualifications, certifications or skills standards in English speaking countries of the world. There were no unit standards based qualifications found to be

comparable to this qualification, but the training courses and qualifications used formed the basis of comparison for this qualification.

The major roleplayers in South Africa all have international standing and conduct work in other African countries as well as in Europe. Work is conducted in accordance with international best practice, and these practices were used as the starting point in determining the requirements of the unit standards for this qualification.

This qualification was compared to the following countries as follows:

UK, Germany and USA:

Allocation of work is fragmented and learners specialise in one particular aspect of the trade. Learning is modular and there is no qualification for an electro-mechanical winder. The complete aspect of electro-mechanical winding will be conducted through a number of people performing specific tasks. South African qualified electro-mechanical winders are in great demand due to their broad knowledge and skills.

New Zealand and Australia:

There is no level 2 qualification for electro-mechanical winding. A learner may undergo a generic certificate in electrical engineering, and then progress to a NQF level 4 qualification in motor rewinding and repair through a three-year apprenticeship programme.

Switzerland:

There is currently no standard training program for winder education. Years ago there used to be an apprenticeship possibility for "Electrical Machines Winder". This apprenticeship was a 4 year educational programme. Currently it is quite difficult to get skilled winders in Switzerland (and also in Central Europe). Companies that require these skills employ qualified winders who in turn train other workers on the specific skills requirements on the job.

Africa:

Countries such as Kenya, Kuwait, Nigeria, Tanzania, Zambia and Zimbabwe have contracts with South African companies (which may be based in the local country as well) to maintain their electro-mechanical components. Training of employees in these countries is conducted according to company standards, which are the same as what was used for determining these unit standards.

It is anticipated that this qualification will be welcomed in these countries and may form the basis for similar local qualifications.

### **ARTICULATION OPTIONS**

This qualification builds on the National certificate in electro-mechanical winding at Level 3 and leads to the National certificate in electro-mechanical winding at Level 5.

Learners who have achieved this qualification have achieved generic skills that would enable them to follow a career in electrical or mechanical engineering. This qualification articulates with the following qualifications:

- ID 48474: Further Education and Training Certificate: Electrical Engineering, Level 4.
- ID 22871: Further Education and Training Certificate: Engineering Fabrication, Level 4.
- ID 23275: Further Education and Training Certificate: Mechanical Engineering: Fitting, Level 4.

### **MODERATION OPTIONS**

- Anyone assessing a learner against this qualification must be registered as an assessor with the relevant ETQA.
- Any institution or learning provider offering learning towards the achievement of this qualification should be accredited as a provider with the relevant ETQA.
- Moderation of assessment should be overseen by the relevant ETQA according to the moderation guidelines provided for in this qualification as well as the agreed ETQA procedures.

### **CRITERIA FOR THE REGISTRATION OF ASSESSORS**

The following criteria should be applied by the relevant ETQA:

- Appropriate qualification and a minimum of 3 years experience in the field of manufacturing or a similar environment. The subject matter experience of the assessor can be established by recognition of prior learning.
- Appropriate experience and understanding of assessment theory, processes and practices.
- Good interpersonal skills and the ability to balance the conflicting requirements of:
  - Maintaining national standards.
  - The interests of the learner.
  - The need for transformation and redressing the legacies of the past.
  - The cultural background and language of the learner.
- Registration as an assessor with the relevant SETA ETQA.
- Any other criteria required by the relevant SETA ETQA.

### **NOTES**

Learners will be assessed against this qualification in a work context appropriate to their needs. This may mean that only certain equipment is available in their workplace, but the requirements of the unit standards must then be matched to that type of equipment where possible. Where specific requirements cannot be met due to unavailability of equipment, the learner will have to undergo training in a different workplace to be exposed to the required equipment prior to assessment.

### **UNIT STANDARDS**

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	9923	Assemble complex components	Level 3	25
Core	9890	Anticipate and troubleshoot machine functioning	Level 4	16
Core	244665	Balance rotating components	Level 4	6
Core	244663	Conduct advanced tests on electro-mechanical components	Level 4	10
Core	14474	Plan and schedule workflow	Level 4	3
Core	119257	Produce and maintain work activity reports	Level 4	8
Elective	116937	Use a Graphical User Interface (GUI)-based spreadsheet application to create and edit spreadsheets	Level 2	4
Elective	117924	Use a Graphical User Interface (GUI)-based word processor to format documents	Level 2	5
Elective	12429	Develop a personal financial plan	Level 3	2
Elective	116714	Lead a team, plan, allocate and assess their work	Level 3	4
Elective	9905	Change and set tooling	Level 4	16
Elective	13254	Contribute to the implementation and maintenance of business processes	Level 4	10
Elective	116292	Demonstrate an understanding of the principles of manufacturing and assembly logistics planning	Level 4	12
Elective	12414	Diagnose and repair faults on low voltage transformers and equipment	Level 4	6
Elective	114877	Formulate and implement an action plan to improve productivity within an organisational unit	Level 4	8
Elective	113880	Inspect, test and maintain Medium / High Voltage transformers	Level 4	6

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	13235	Maintain the quality assurance system	Level 4	5
Elective	13224	Monitor the application of safety, health and environmental protection procedures	Level 4	4
Elective	9925	Perform general grinding operations	Level 4	14
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Fundamental	12155	Apply comprehension skills to engage written texts in a business environment	Level 4	5
Fundamental	9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	6
Fundamental	119462	Engage in sustained oral/signed communication and evaluate spoken/signed texts	Level 4	5
Fundamental	9016	Represent analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 4	4
Fundamental	119471	Use language and communication in occupational learning programmes	Level 4	5
Fundamental	7468	Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	6
Fundamental	12153	Use the writing process to compose texts required in the business environment	Level 4	5





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## UNIT STANDARD:

*Dismantle basic components and sub-assemblies*

SAQA US ID		UNIT STANDARD TITLE	
244664		Dismantle basic components and sub-assemblies	
ORIGINATOR		PROVIDER	
SGB Manufacturing and Assembly Processes			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 2	3

**SPECIFIC OUTCOME 1**

Plan to dismantle components and sub-assemblies.

**SPECIFIC OUTCOME 2**

Prepare tools and the work area to dismantle components and sub-assemblies.

**SPECIFIC OUTCOME 3**

Dismantle and mark components and sub-assemblies.

**SPECIFIC OUTCOME 4**

Complete and report on the dismantling process.



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## UNIT STANDARD:

*Conduct advanced tests on electro-mechanical components*

SAQA US ID		UNIT STANDARD TITLE	
244663		Conduct advanced tests on electro-mechanical components	
ORIGINATOR		PROVIDER	
SGB Manufacturing and Assembly Processes			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	10

**SPECIFIC OUTCOME 1**

Plan to test electro-mechanical components.

**SPECIFIC OUTCOME 2**

Prepare tools and the work area to test electro-mechanical components.

**SPECIFIC OUTCOME 3**

Test electro-mechanical components.

**SPECIFIC OUTCOME 4**

Complete and report on the tests conducted.



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

## UNIT STANDARD:

*Balance rotating components*

SAQA US ID		UNIT STANDARD TITLE	
244665		Balance rotating components	
ORIGINATOR		PROVIDER	
SGB Manufacturing and Assembly Processes			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	6

**SPECIFIC OUTCOME 1**

Plan to balance rotating components.

**SPECIFIC OUTCOME 2**

Prepare tools and the work area to balance rotating components.

**SPECIFIC OUTCOME 3**

Add or remove mass to balance components.

**SPECIFIC OUTCOME 4**

Complete and report on the balancing process undertaken.